REMARKS

Claims 1 through 17 were pending in this Application. Claims 16 and 17 have been cancelled without prejudice.

Applicants request entry of this Amendment and favorable reconsideration of the pending claims.

§102 Rejection

In the Official Action, claims 16 and 17 were rejected under 35 U.S.C. §§102(b) as anticipated by U.S. Patent No. 4,399,275 to Sears ("Sears"). To advance the prosecution of this application, Applicants have muted this rejection by canceling claims 16 and 17.

§103 Rejections

Claims 1 to 15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sears.

Sears discloses a process for the preparation of cellulose acetate which may be practiced using a "variety of cellulosic material" (col. 3, lines 42-44), but which provides examples employing only softwood pulps prepared from southern pine.

The Examiner correctly notes that the difference between the process claimed in the instant invention (at least in claims 1-5) and Sears is the type of cellulosic material used in the process and the temperature. The Examiner concludes that while Sears exemplifies acetylation temperatures which are different than that presently claimed "depending on the type of cellulosic material used, the process may require slight preferential adjustments to secondary reaction parameters like the temperature and the percentage by weight of reagents . . . and that this would produce cellulose acetate of different purity or texture." Based on the foregoing, the Examiner concludes that it would have been obvious to those skilled in the art to make slight

preferential adjustments in the type of material used, and in the secondary reaction parameters, based on need, cost, availability and/or convenience of use.

Applicants' respectfully traverse and request reconsideration of the foregoing rejection as relying upon impermissible hindsight and for its failure to consider the surprising benefits of the invention explained in a Declaration under Rule 132 filed on October 20, 2003 (the "Declaration"). As explained in the Declaration, the examples contained in Sears and in the present application enable a fair comparison of the results achieved by Sears with the presently claimed process, and demonstrate that the presently claimed process has significant and surprising advantages over the prior art.

As explained in the Declaration, the presently claimed process is directed to a method for making cellulose acetate which is useful in commercial applications having stringent haze requirements. Consequently, the process steps cannot destroy cellulose in the cellulosic material utilized in the process, and must be capable of yielding cellulose acetate product having an intrinsic viscosity in the prescribed range for commercial applications (about 1.4 dl/gm to 1.7 dl/gm). Further, it must be capable of doing the foregoing at commercially viable conditions and with a commercially viable yield. Because the claimed acetylation reaction uses an acid catalyst, extending the reaction time and/or raising the reaction temperature causes increased consumption of cellulose by the acid catalyst. Accordingly, the acetylation reaction temperature and the acetylation reaction time must be controlled so that 1) the reaction initiates; 2) the reaction proceeds to completion in a commercially reasonable time; and 3) the intrinsic viscosity of the cellulose acetate product falls within the prescribed range. Further, it is the standard to run an acetylation reaction for 170-190 minutes. In the chemical process industry, as in all industry, "time is money." Reaction conditions which require that an acetylation reaction run for significantly more than 190 minutes are disadvantageous.

The Declaration further explained that in the case of the softwood pulp utilized in Sears, the acetylation reaction temperature had to be lowered to 19 °C in Example 6 to slow the reaction to a point where it could be controlled. The cellulosic material modified with 20% alkylene oxide was so reactive that at higher acetylation temperatures (in the range of 30 °C), the reaction would proceed so quickly that the exothermic heat of reaction would cause the temperature of the reactor contents to increase rapidly. At elevated temperature the acid catalyst consumes the cellulosic material generating additional heat, preventing the formation of cellulose acetate and/or yielding relatively small amounts of cellulose acetate having short cellulose chains which are characterized by an intrinsic viscosity which is below the prescribed range. Further, even at 19 °C, the reaction had to be terminated at a time when the intrinsic viscosity of the cellulose acetate product was in the prescribed range. For this reason, the acetylation reaction of Example 6 of Sears was terminated at 154 minutes. Extending the reaction time materially longer or significantly raising the reaction temperature would have resulted in the acid catalyst consuming more cellulose so that the intrinsic viscosity of any cellulose acetate product would be outside the acceptable range and would also decrease the product yield. In the present invention, the acetylation temperature of 32 °C was selected for Example 1 because that was the temperature necessary to get the alkylation reaction to initiate with the less reactive alkylene oxide modified hardwood cellulosic material and proceed to substantial completion within the industry standard time frame for this reaction, i.e., 170-190 minutes (see Sears, col. 6, lines 51-53). If the alkylation reaction were to be conducted at 19 °C, it would have proceeded, if at all, far more slowly and would not have progressed to an acceptable degree within 190 minutes.

In the Declaration, the inventor, who is an expert in pulp and paper chemistry, explained how the examples in the present application demonstrate that the process of this invention achieves results which are surprisingly superior to the prior art while at the same time

requiring the use of lesser amounts of alkylene oxide. Sears used a greater percentage of alkylene oxide (20% PO compared to 10% PO) to produce a cellulose acetate with approximately the same triacetate haze (6.7 compared to 6.5). The Examples demonstrate that it is not possible to achieve the same results with less alkylene oxide merely by changing reaction conditions such as temperature and reaction time. Specifically the Declaration explained that, Example No. 7 of Sears subjected softwood cellulosic material which had been treated with 15% propylene oxide to an acetylation reaction at 23 °C and achieved a pulp having a triacetate haze level of 11.1. Further, a control pulp which was not treated with propylene oxide was acetylated at 28 °C and yielded cellulose acetate having a triacetate haze value of 84.7. The results of the 3 examples are summarized below.

Sears 1 Example	Example 6	Example 7	Example 9
Propylene oxide added	20%	15%	0%
Percentage – OC_3H_6OH	4.4	3.6	0
Esterification Temp.	19 °C	23 °C	28 °C
Triacetate Haze	6.7	11.1	84.7

From this the Declaration points out that reducing the propylene oxide concentration in the processing of softwood pulp adversely affects the triacetate haze value of the cellulose acetate produced and eliminating the alkylene oxide treatment altogether results in cellulose acetate having an extraordinarily high triacetate haze level (84.7). It would be evident to one skilled in the art that reducing the alkylene oxide concentration in Sears, for example, from the 15% of Example 7 to 10%, would result in cellulose acetate having a triacetate haze level considerably higher than the 11.1 value achieved with 15% PO. The minor difference in the esterification temperature in Example 6 (19 °C) and in Example 7 (23 °C) would not affect the triacetate haze value of the cellulose acetate produced and in any event are necessary since

the 15% alkylene oxide treated pulp of Example 7 was less reactive than the 20% alkylene oxide treated pulp of Example 6. For this reason, it was necessary to slightly raise the esterification temperature in Example 7 and to continue the reaction for a longer time (154 minutes in Example 6 vs. 237 minutes in Example 7) to enable the reaction to proceed to substantial completion. **The suggestion that reaction temperatures and times can be changed to achieve better triacetate haze levels ignores that meaningful results require that the desired reaction initiate and proceed to substantial completion, in a commercially reasonable time.**

For the above reasons, a side-by-side comparison, for example, of 10% PO modified hardwood and softwood cellulosic materials acetylated at 19 °C for like reaction times (say 170 to 190 minutes) would not present a fair comparison. The hardwood cellulosic material treated with 10% PO would not be reactive at 19 °C and the reaction would not proceed to a meaningful degree in a reasonable reaction time (e.g. 170-190 minutes). Hence there would be little or no cellulose acetate produced. On the other hand, the 19 °C reaction temperature and 170 minute reaction time would be favorable for the 10% PO modified softwood material, **but would yield cellulose acetate having a triacetate haze materially higher than the 11.1 reported for the 15% PO material in Example 7 of Sears**. If the same experiment were to be run at 32 °C, the reaction of the soft- wood cellulosic material would proceed so rapidly that the cellulose would be consumed by the acid catalyst yielding little if any cellulose acetate and the product would have an unacceptably low intrinsic viscosity. However, at 32 °C the reaction conditions would be favorable for the less reactive hardwood cellulosic material, so that cellulose acetate having substantially the specifications of Example 1 of the application would be produced.

In view of the foregoing, it was the opinion of the Declarant, as an expert that in the field of cellulosic materials and the production of cellulose acetate, that the most meaningful

comparison of the present invention with Sears is presented by Example 6 of Sears and Example 1 of the present application, as set forth below.

	Softwood Cellulosic Material Example 6 of Sears 1	Hardwood Cellulosic Material Example 1 of Present Appl.
PO Treatment	20%	10%
Propylene Oxide %	3.6	2.9
Acetylation Temperature	19 °C	32 °C
Reaction Time	154 minutes	180 minutes
Triacetate Haze	6.7	6.5

Both Examples were conducted at commercially reasonable conditions and proceeded to substantial completion in a commercially reasonable time. **Notably, the use of hardwood cellulosic material offers the following significant and unexpected advantages over softwood:**

1) **it acheives a desirable 6.5 triacetate haze with only 10% PO;**
2) **the reaction could be conducted at 32°C which did not require special cooling devices; and**
3) **the reaction proceeds to completion in a commercially reasonable 180 minutes.**

The Declarant further opined that as one of at least ordinary skill in the art, *prior to the instant invention he would not have expected hardwood cellulosic material to have advantages over softwood material, and that to his knowledge the invention of the Sears patent was never put into commercial use because the trade considered the required low reaction temperature (i.e., approx. 19°C) and high alkylene oxide usage to be unacceptable.*

Since the present invention surprisingly overcomes the problems encountered with the cited prior art, it is respectfully submitted that the rejection of the invention as obvious under Section 103 is improper.

In view of the foregoing, it is respectfully submitted that all of the claims now pending are directed to a process which has surprising and unexpected advantages over the process disclosed by Sears.

Early and favorable consideration of the within claims is earnestly solicited.

No additional fees are believed due herewith. If any additional fees are due, the Commissioner is hereby authorized to charge the same to Deposit Account No. 50-0540.

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Respectfully submitted,

By: _____

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